

REMARKS

The Applicant would like to thank Examiner Stouffer for her time and helpful suggestions during the telephonic interview of September 11, 2008. Claims 1-4 are pending. Claim 1 is amended herein to clarify that more than one monolayer of TMA remains on the substrate surface after removal of gaseous TMA from the reaction chamber. Support for this amendment may be found, for example, at page 13 of the specification.

In the Final Office Action of July 9, 2008, each of the pending claims is rejected under 35 U.S.C. § 103, citing Dillon (Surface Science 322 (1995), 230-242) in view of Penneck *et al.* (U.S. Patent No. 4,985,313).

1. The thickness of a deposited film is not merely a function of the time of substrate exposure.

The Examiner states that, in view of Dillon, “anyone of ordinary skill in the art would recognize that the thickness of a deposited film, then, is *only* a function of the time of substrate exposure to the precursor.” (Emphasis added.) Applicant disagrees. First, deposition rates also depend, inter alia, on substrate and precursor temperatures. Second, with respect to the present case, it is important to understand that ALD reactions, such as those in Dillon, are *self-limiting* such that additional exposure time *will not increase film thickness*. Deposition rates of more than one monolayer per cycle simply are not contemplated in Dillon or Penneck, singly or in combination, and there is no teaching of how to modify Dillon to achieve higher deposition rates or any reason to do so.

2. Dillon’s process is self-limiting and distinct from Applicant’s

The Examiner found that “though the applicant argues that process of Dillon is self-limiting, Dillon discloses using the same precursor as the applicant, so if the use of this precursor was truly self-limiting, the ‘more than one monolayer’ limitation in claim 1 would be improper.”

As discussed in the interview, Applicant respectfully notes that Applicant’s claimed process does not use the same precursors as Dillon—Applicant uses atomic oxygen, while Dillon does not. Thus, the “more than one monolayer” element is proper.

Dillon repeatedly states that his process is “self-limiting” and “complete.” See, e.g., the Abstract. Dillon’s process *intentionally* deposits no more than one monolayer per cycle and it would be contrary to Dillon’s goals to do otherwise; Applicant’s process, using a different

oxidant, deposits more than one monolayer per cycle. Because Dillon is concerned with the self-limiting nature of the ALD process and the benefits associated therewith, Dillon actually teaches away from depositing more than one monolayer.

3. Dillon does not disclose variation in *thickness* of film deposition per cycle

The Examiner also found that “Dillon et al. discloses that the thickness of an aluminum oxide layer after each cycle depends upon the amount of amorphous aluminum oxide present and the reaction mechanism (see pages 239-241 et seq.).” Applicant disagrees. Dillon discloses that the coverage of the substitute may vary only up to—and not more than—one complete monolayer.

Applicant respectfully notes that there is a difference between *coverage* and *thickness* of deposition and that Dillon discloses variations in coverage only. Coverage is known as a two-dimensional measure: a particular two-dimensional (x-y) section of a substrate is either covered by a deposited film or it is not.

Consistent with this understanding, Dillon does not use the word *thickness*. Rather, Dillon uses the word *coverage* multiple times in and around the pages cited by the examiner. See p.237, col. 2; p. 238, c. 1, etc. Dillon’s disclosure makes it clear that he is concerned with quantifying the percentage of surface species reaction (a measure of coverage) not the thickness of the resulting deposited film.

For example, Dillon states that “[t]he reaction rate can be written as $d\theta/dt = -k\theta$, where k incorporates the reactant flux at 0.01 Torr and 500 K and $\theta_{OH} = 0.7ML$ following a saturation H_2O exposure at 500 K.” As such, Dillon’s reaction is one of constant thickness, namely one surface monolayer. Dillon’s reference to “0.7ML” is a quantification of the concentration of surface species (i.e. percentage $AlOH$ coverage of the surface) not of thickness. Indeed, “ $\theta_{OH} = 0.7ML$ ” cannot refer to thickness, since then Dillon’s equation “ $d\theta/dt = -k\theta$ ” would be implying that the deposited layer gets *thinner* over time.

4. Deposition layer thickness per cycle is not a variable of routine experimentation

Throughout the pages cited by the Examiner, Dillon repeatedly cabins the discussion of monolayer coverage with disclosure of the reaction being “self-limiting” and going “to completion.” Each of Dillon’s figures explicitly show deposition of no more than monolayer at a

time. See, e.g., Fig. 15. Dillon repeatedly speaks of standard limitations on precursor concentrations, such as “saturation hydroxyl coverage,” that are inconsistent with and opposed to a notion of thickness as a variable of routine experimentation. As such, Dillon does not discuss variation in deposition layer thickness.

Dillon is concerned with self-limiting reactions that only deposit up to a monolayer. Consistent with this, there is no teaching or suggestion, in Dillon or elsewhere, that more than one monolayer can be deposited per cycle, much less any teaching of how to achieve deposition of more than one monolayer per cycle. There is also no reason to attempt to deposit more than one monolayer; to do so would be contrary to the goals of Dillon.

Thus, because neither Dillon nor Penneck teach the deposition of more than one monolayer per cycle, nor provide any reason to deposit more than one monolayer per cycle, nor teach how Dillon could be modified to deposit more than monolayer per cycle, Applicant’s claimed process is not obvious in light of Dillon in view of Penneck and the rejection under 35 U.S.C. § 103 should be withdrawn.

5. Conclusion

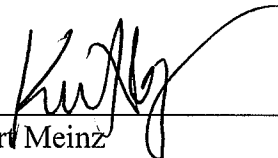
Although the present communication includes characterizations of and alterations to the pending claims, Applicants are not conceding in this application that previous, cancelled, or other claims are not patentable. Rather, any alterations or characterizations are being made to facilitate expeditious prosecution of this application. Applicants reserve the right to pursue at a later date any previously pending or other broader or narrower claims that capture any subject matter supported by the present disclosure, including subject matter found to be specifically disclaimed herein or by any prior prosecution. Accordingly, reviewers of this or any parent, child or related prosecution history shall not reasonably infer that Applicants have made any disclaimers or disavowals of any subject matter supported by the present application.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

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Dated: 10/9/2008

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